FIG. 1

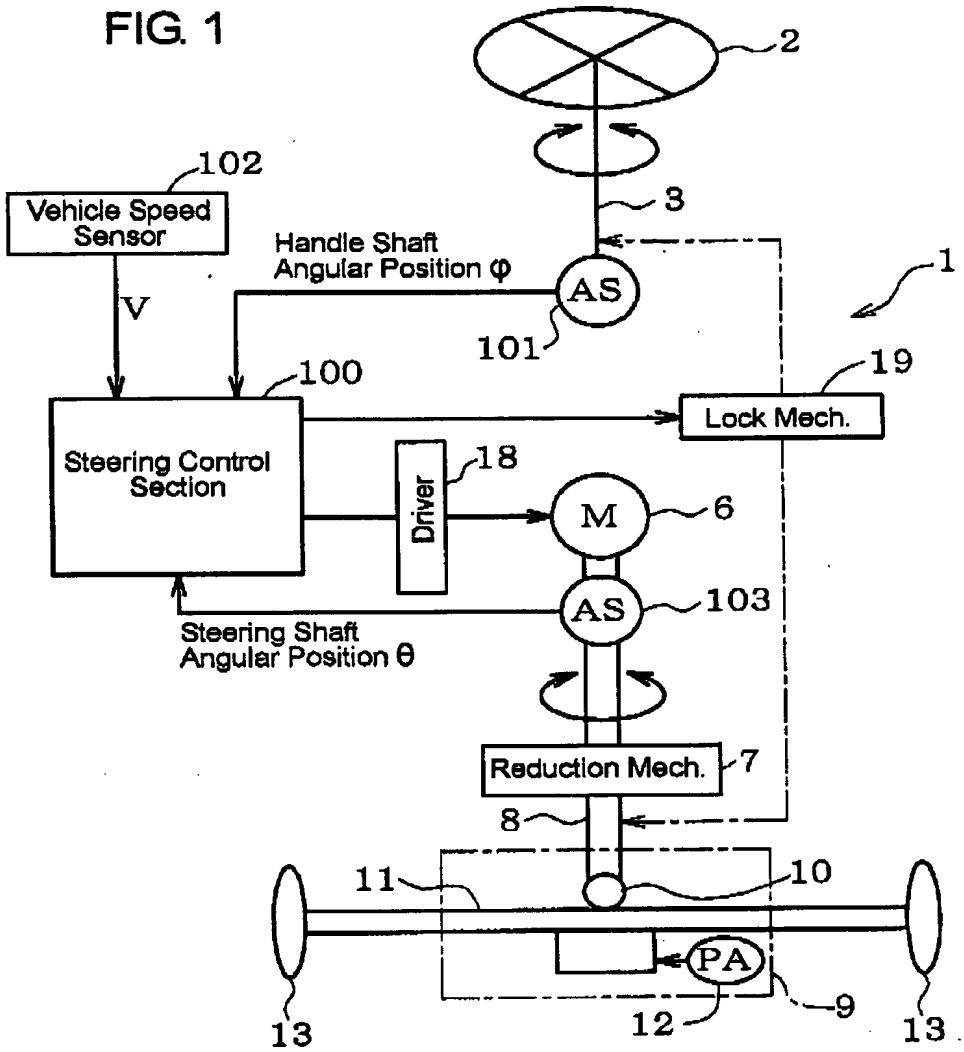

2
3
1
102
Vehicle Speed Sensor
V
Handle Shaft Angular Position φ
AS
101
19
100
Lock Mech.
Steering Control Section
Driver
18
M
6
AS
103
Steering Shaft Angular Position θ
Reduction Mech.
7
8
11
10
PA
9
12
13
13

FIG. 2

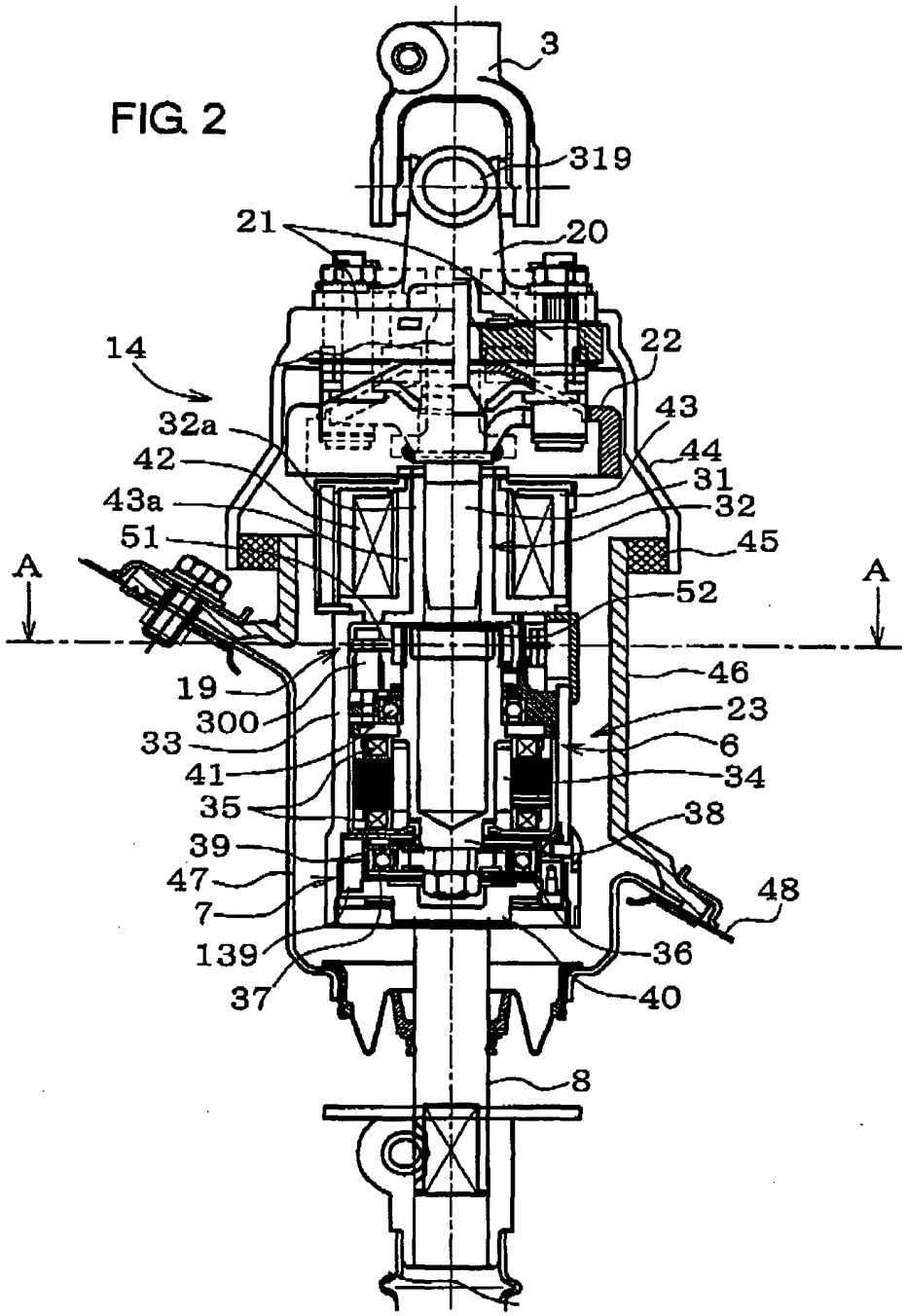

3
319
21
20
14
22
43
32a
44
42
31
43a
32
51
45
A
A
52
19
46
300
23
33
6
41
34
35
38
39
47
48
7
139
36
37
40
8

FIG. 3

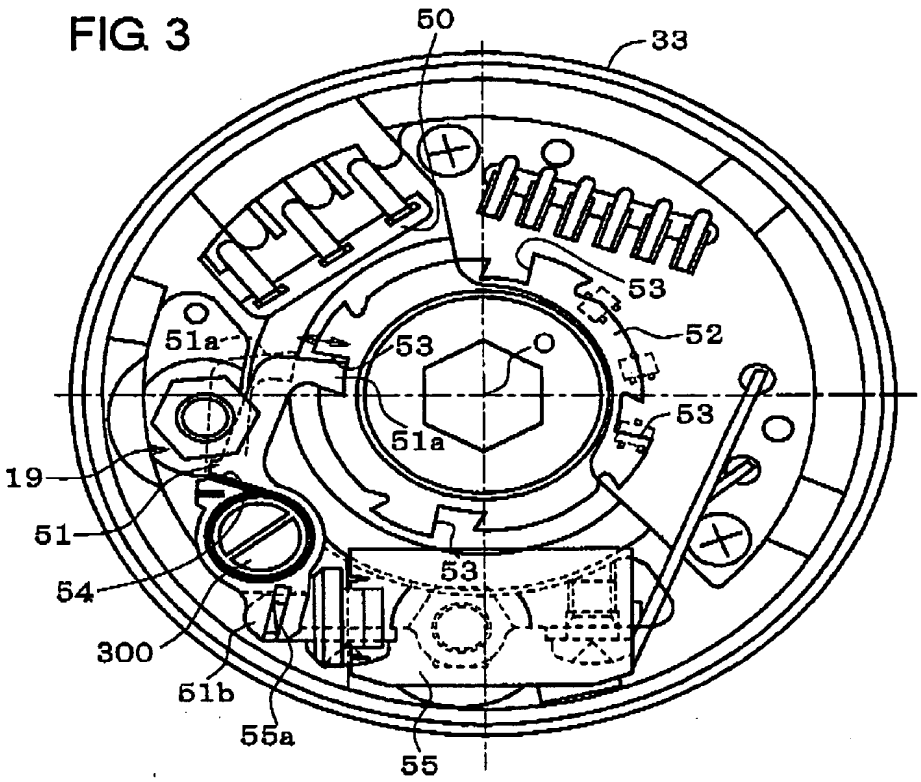


FIG. 4

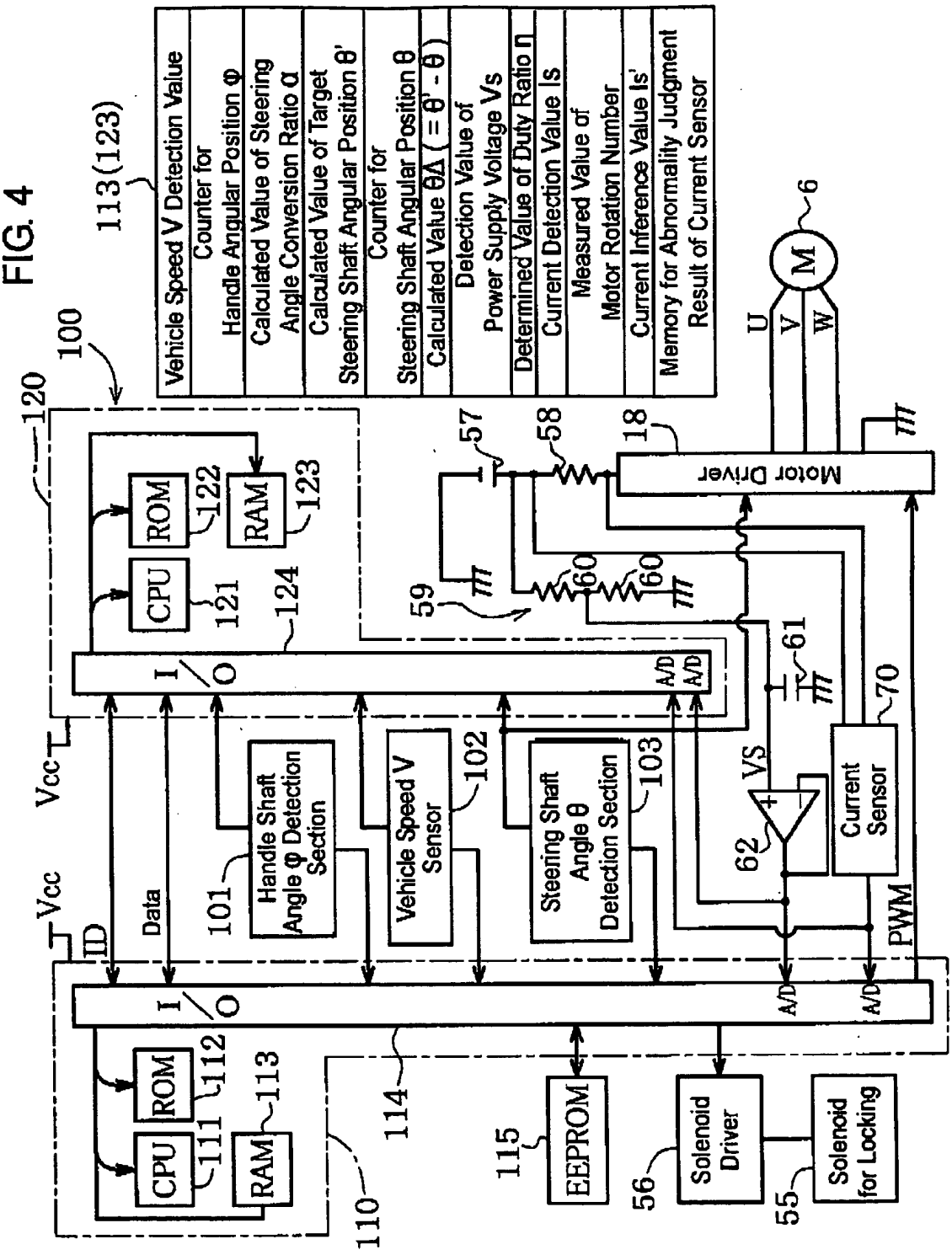

113(123)
Vehicle Speed V Detection Value
Counter for Handle Angular Position φ
Calculated Value of Steering Angle Conversion Ratio α
Calculated Value of Target Steering Shaft Angular Position θ'
Counter for Steering Shaft Angular Position θ
Calculated Value θΔ (= θ' - θ)
Detection Value of Power Supply Voltage Vs
Determined Value of Duty Ratio η
Current Detection Value Is
Measured Value of Motor Rotation Number
Current Inference Value Is'
Memory for Abnormality Judgment Result of Current Sensor
100
120
ROM
122
RAM
123
CPU
121
124
I/O
A/D
Vcc
Data
ID
101
Handle Shaft Angle φ Detection Section
Vehicle Speed V Sensor
102
Steering Shaft Angle θ Detection Section
103
57
58
18
Motor Driver
59
60
61
VS
62
Current Sensor
70
PWM
U
V
W
M
6
110
112
113
111
114
115
EEPROM
56
Solenoid Driver
55
Solenoid for Locking

FIG. 5

130

Vehicle Speed (V)	V_1	V_2	V_3	.....	V_n
Steering Angle Conversion Ratio (α)	α_1	α_2	α_3	.....	α_n

$\alpha = \theta / \varphi$

φ : Handle Shaft Angular Position

θ : Steering Shaft Angular Position

FIG. 6

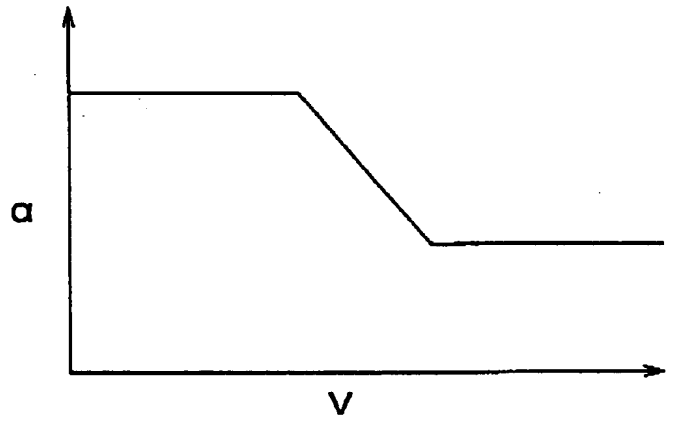


FIG. 7

131

$\Delta\theta$ \ Vs	Vs_1	Vs_2	Vs_3	Vs_4	...	Vs_n
$\Delta\theta_1$	η_{11}	η_{12}	η_{13}	η_{14}	...	η_{1n}
$\Delta\theta_2$	η_{21}	η_{22}	η_{23}	η_{24}	...	η_{2n}
$\Delta\theta_3$	η_{31}	η_{32}	η_{33}	η_{34}	...	η_{3n}
$\Delta\theta_4$	η_{41}	η_{42}	η_{43}	η_{44}	...	η_{4n}
⋮	⋮	⋮	⋮	⋮	⋮	⋮
$\Delta\theta_m$	η_{m1}	η_{m2}	η_{m3}	η_{m4}	...	η_{mn}

η : Duty Ratio

$\Delta\theta = \theta' - \theta$

θ' : Target Steering Shaft Angular Position

θ : Present Steering Shaft Angular Position

FIG. 8

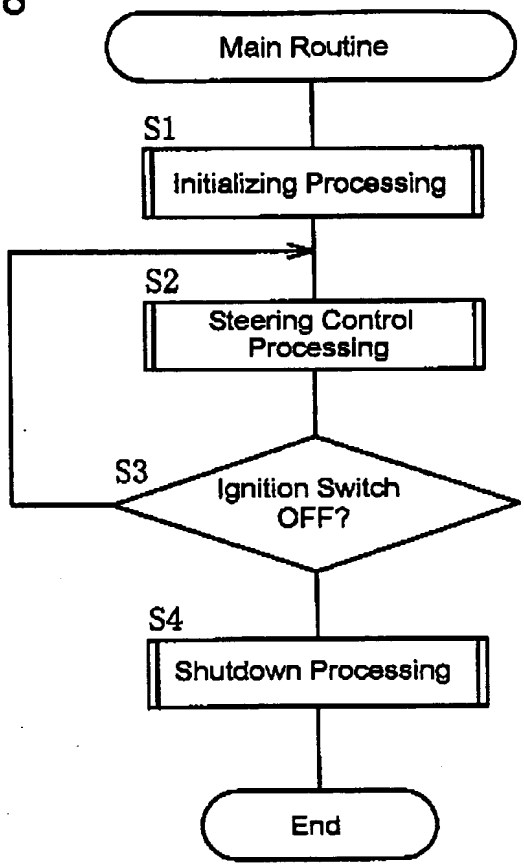

Main Routine
S1
Initializing Processing
S2
Steering Control Processing
S3
Ignition Switch OFF?
S4
Shutdown Processing
End

FIG. 9

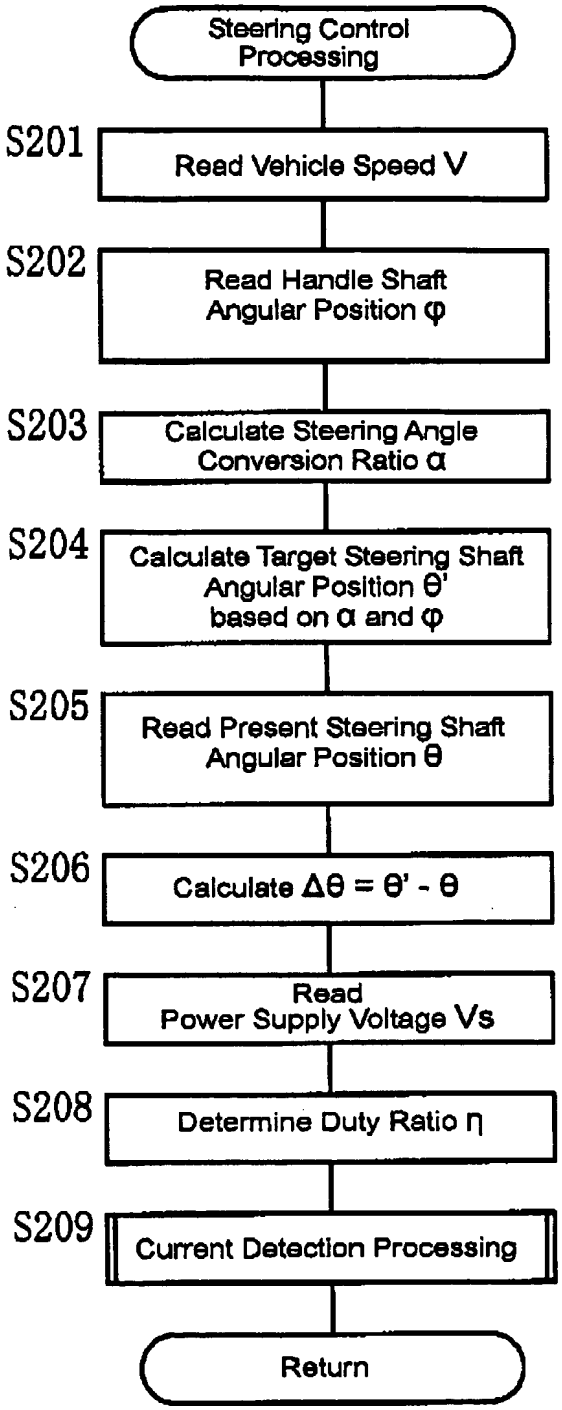

Steering Control Processing
S201
Read Vehicle Speed V
S202
Read Handle Shaft Angular Position φ
S203
Calculate Steering Angle Conversion Ratio α
S204
Calculate Target Steering Shaft Angular Position θ' based on α and φ
S205
Read Present Steering Shaft Angular Position θ
S206
Calculate Δθ = θ' - θ
S207
Read Power Supply Voltage Vs
S208
Determine Duty Ratio η
S209
Current Detection Processing
Return

FIG. 10

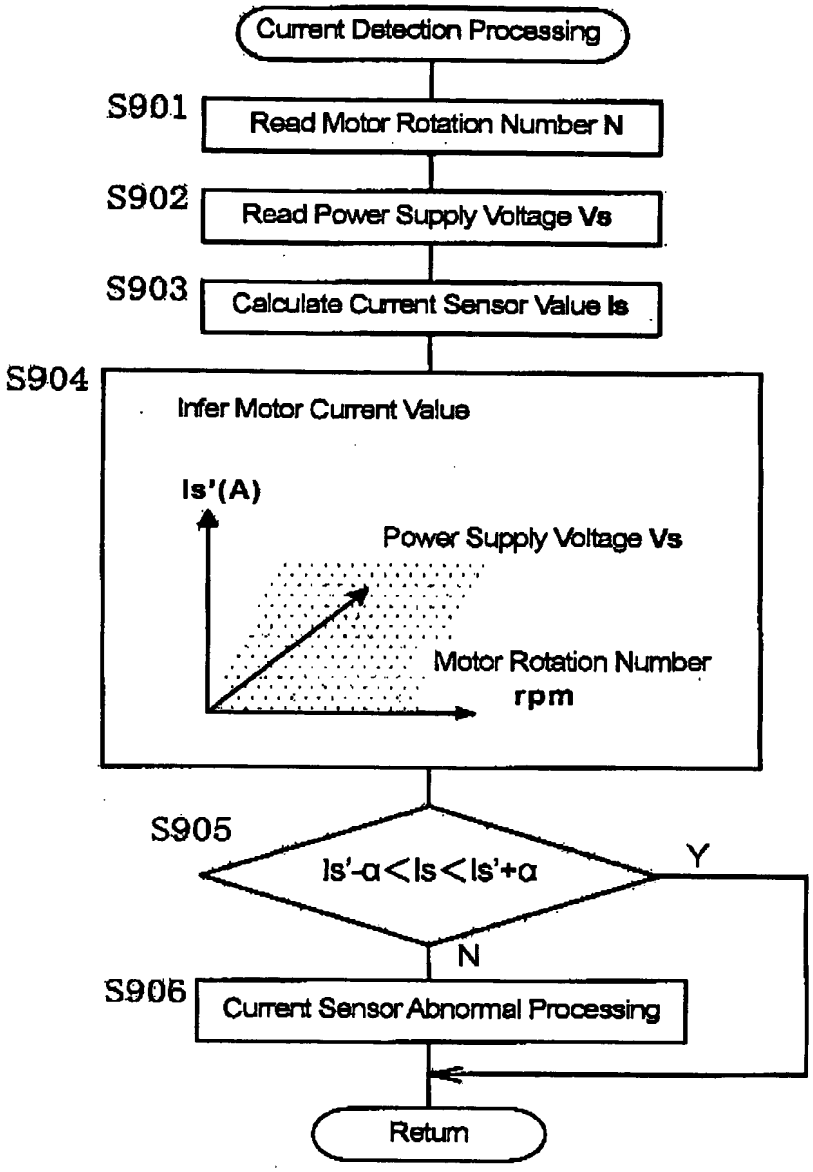

Current Detection Processing
S901
Read Motor Rotation Number N
S902
Read Power Supply Voltage Vs
S903
Calculate Current Sensor Value Is
S904
Infer Motor Current Value
Is'(A)
Power Supply Voltage Vs
Motor Rotation Number
rpm
S905
Is'-α<Is<Is'+α
Y
N
S906
Current Sensor Abnormal Processing
Return

FIG. 11

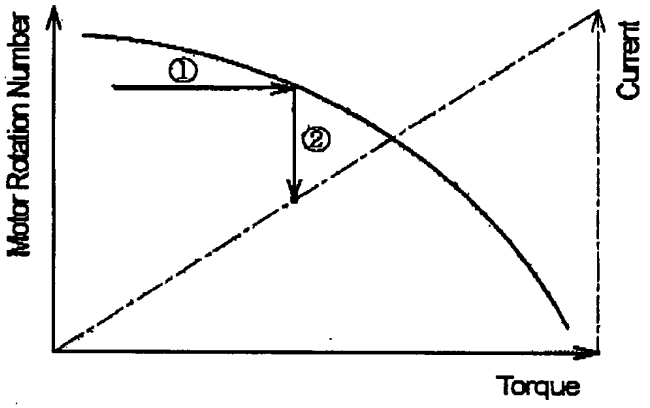
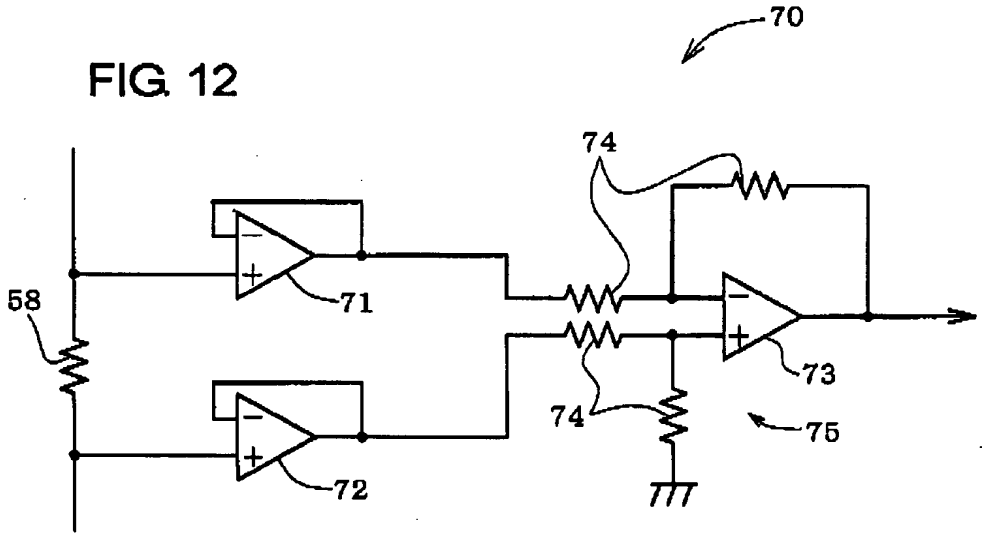

Motor Rotation Number
Current
Torque
①
②

FIG. 12


70
74
58
71
73
74
75
72